

1    WHAT IS CLAIMED IS:

3        1.     A method for forming a large diameter, subterranean soil cement column in  
4 material located in a subterranean earth situs utilizing a large diameter soil processing tool  
5 with a pilot in conjunction with a preformed sacrificial guide, comprising the steps:

6                forming a sacrificial guide by advancing and rotating a small diameter soil  
7 processing tool into said situs to break said material into pieces, said small diameter soil  
8 processing tool forming a hole as it advances;

9                while advancing said small diameter soil processing tool into said situs,  
10 introducing a cement slurry into said pieces from said tool at a velocity sufficient to  
11 hydraulically divide said pieces into particles and mix said cement slurry with said particles to  
12 form a soil-cement slurry, said soil-cement slurry containing cementitious solids, soil particles  
13 and free water;

14                withdrawing said small diameter soil processing tool from said situs;

15                while withdrawing said small diameter soil processing tool, rotating said tool at  
16 a rotational speed to exert a centrifugal force by said tool upon said soil-cement slurry in  
17 excess of two G's, whereby said centrifugal force causes the solids of said soil-cement slurry  
18 to migrate further from the center of said hole than said free water to form a first cylindrical  
19 region at the outer edges of said hole and a second cylindrical region at the center of said  
20 hole, said first region having a smaller proportion of free water than said second region;

21                allowing said mixture in said hole to set up;

22                advancing said pilot of soil large diameter processing tool into said second region  
23 of said sacrificial guide;

24                driving said tool downwardly, and forming a large diameter soil-cement column  
25 by physically and hydraulically dividing said material into particles and mixing cement slurry  
26 with said particles; and

1                   breaking said sacrificial guide with said large diameter soil processing tool,  
2 whereby said sacrificial guide fragments are mixed into and become part of said soil-cement  
3 column formed by said large diameter soil processing tool.

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5                   2.     The method of claim 1 comprising the further step:

6                         drilling out said second region of said sacrificial guide before advancing said pilot  
7 into said second region.

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9                   3.     The method of claim 1 wherein said pilot is tipped with an auger and said auger  
10 is adapted to drill out said second region of said sacrificial guide as said tool is advanced.

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12                  4.     A method for solidifying a large volume of material located in a subterranean  
13 earth situs by forming large diameter soil-cement columns, comprising the steps:

14                         forming an array of soil-cement sacrificial guides at precise, predetermined  
15 locations in said subterranean situs,

16                         placing the pilot of a large diameter soil processing tool into one of said sacrificial  
17 guides,

18                         driving said large diameter soil processing tool downwardly, forming a soil-  
19 cement column by mechanically and hydraulically dividing said material into particles and  
20 mixing cement slurry with said particles,

21                         guiding said large diameter tool as said tool is driven downwardly by engagement  
22 of the pilot of said tool with said sacrificial guide,

23                         breaking said sacrificial guide into soil-cement fragments with said large diameter  
24 tool as said tool advances downwardly,

25                         mixing said soil-cement fragments into said large diameter soil-cement column  
26 formed by said large diameter tool, and

1                    withdrawing said large diameter tool and placing its pilot into another of said  
2                    sacrificial guides and repeating the process.

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4                 5.        The method of claim 4 wherein said material is intended to support an airport  
5                    runway.

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7                 6.        The method of claim 4 wherein said material is toxic.

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9                 7.        The method of claim 4 wherein said material is radioactive.

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11                8.        The method of claim 4 wherein each of said soil-cement sacrificial guides is  
12                    hollow.

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14                9.        The method of claim 4 wherein the diameter of said large diameter tool is 8 feet  
15                    or more.

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17                10.      A method for solidifying a large volume of material located in a subterranean  
18                    earth situs by forming large diameter soil-cement columns, wherein said situs is intended to  
19                    support an airport runway, comprising the steps:

20                    forming an array of soil-cement sacrificial guides at precise, predetermined  
21                    locations in said subterranean situs,

22                    placing the pilot of a large diameter soil processing tool into one of said sacrificial  
23                    guides,

24                    driving said large diameter soil processing tool downwardly, forming a soil-  
25                    cement column by mechanically and hydraulically dividing said material into particles and  
26                    mixing cement slurry with said particles,

1                   guiding said large diameter tool as said tool is driven downwardly by engagement  
2 of the pilot of said tool with said sacrificial guide,  
3                   breaking said sacrificial guide into soil-cement fragments with said large diameter  
4 tool as said tool advances downwardly,  
5                   mixing said soil-cement fragments into said large diameter soil-cement column  
6 formed by said large diameter tool, and  
7                   withdrawing said large diameter tool and placing its pilot into another of said  
8 sacrificial guides and repeating the process.

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10                 11. The method of claim 10 wherein interstitial gaps of unprocessed material remain  
11 between said soil-cement columns formed by said large diameter tool, and said interstitial  
12 gaps are treated with said small diameter soil processing tool.

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14                 12. A method for solidifying a large plume of radioactive material located in a  
15 subterranean earth situs by forming large diameter soil-cement columns, which prevent or  
16 reduce underground migration of said radioactive plume, comprising the steps:

17                   forming an array of soil-cement sacrificial guides at precise, predetermined  
18 locations in said subterranean situs,

19                   placing the pilot of a large diameter soil processing tool into one of said sacrificial  
20 guides,

21                   driving said large diameter soil processing tool downwardly, forming a soil-  
22 cement column by mechanically and hydraulically dividing said material into particles and  
23 mixing cement slurry with said particles,

24                   guiding said large diameter tool as said tool is driven downwardly by engagement  
25 of the pilot of said tool with said sacrificial guide,

1                   breaking said sacrificial guide into soil-cement fragments with said large diameter  
2 tool as said tool advances downwardly,  
3                   mixing said soil-cement fragments into said large diameter soil-cement column  
4 formed by said large diameter tool, and  
5                   withdrawing said large diameter tool and placing its pilot into another of said  
6 sacrificial guides and repeating the process.

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